

Evaluating Moral Schemata Learning

Claudia Jaquelina Gonzalez^{*1}, Ernesto Octavio Lopez² and Guadalupe Elizabeth Morales²

¹Department of education, University of Monterrey, Monterrey, Mexico

²Department of psychology, Autonomous University of Nuevo Leon, Monterrey, Mexico

¹jackiegzz@prodigy.net.mx, ²elopez42@att.net.mx, ³moramar24@yahoo.com.mx

Abstract

Students involving in a moral development course that included a dilemma discussion were tested in a semantic priming experiment and in an attention experiment before and after the course. The first experiment compared reaction times of "moral related words" with "non related words" whereas the second experiment tested if moral "related words" had an effect on attention tasks after the course. Here, moral related words were obtained from a semantic network technique that generates moral schemata based on subjects' moral knowledge but not from an idiosyncratic moral schema. Results showed a priming effect on "moral related words" only after the course. The second experiment also showed significant differences for "moral related words" after the course. Implications for moral education and moral cognitive modeling are presented.

Keywords

Moral Development; Moral Schemata; Learning

Introduction

Moral development has been at the center of intense research activity. Piaget the pioneer in studying moral development from a cognitive perspective, proposed that moral development and logical reasoning belong to the same cognitive processes rooted in action and going through a first stage of egocentrism, characterized with unilateralism. This stage is followed by another one, characterized with reciprocity. Piaget also suggested two types of morality: Heteronomous and autonomous morality. Heteronomous morality is characterized with judgement on what is good or bad according to consequences. Justice is based in obedience and respect to authority in order to avoid punishment. A system of rules is imposed on the outside. On the other hand, autonomous morality considers a principle of equality, mutual respect, and cooperative interpersonal relations. A system of principles comes within the person. Decisions are free and rational.

Following Piaget's model, Kohlberg envisioned moral

development as series of incremental universal stages (preconventional, conventional and post conventional), each qualitatively different from the previous one, but also different from any other stage.

For a stage, cognitive structures determined by the interaction of the individual with the environment, are action structures where new structures are superior and the goal is a progressive construction of moral meaning. Moral growth depends on the interaction with the environment. Positive environments will foster development while negative environment will inhibit it.

From the point of view of human information processing theory, moral reasoning has not been completely approached since no cognitive model has been established to include participation of attentive, memory and perceptual processes on moral reasoning. For example, no description on memory processes and knowledge representation of moral content have been investigated under Kohlberg's moral educational program. Cognitive accommodation and assimilation for moral schemata must be understood in order to relate moral reasoning outcomes to a specific use of dilemma discussion.

The current article sheds light on the role of semantic information processing in moral judgment behaviour and the way this moral processing is impacted by educational interventions. Specifically, it is argued that after a course of moral development based on Lind's educational intervention program the acquisition of new memory moral knowledge in long term memory activates controlled and automatic cognitive processing for moral concepts, which is important because sometimes a person might explicitly behave as if s/he reasons morally based on newly acquired moral information, but no new moral information has been stored in long term memory. Then, complementary evaluation is demanded to ensure that new meaning formation of moral concepts has been achieved. Here,

the acquisition of new meaningful information means the integration of new moral concepts in a moral semantic net as proposed by knowledge representation theories (by semantic content) rather than the development of an integration rule for moral schemata (algebraic summative, multiplicative or average rules) as it was proposed by information integration theory models of moral social development.

Predictions based on a semantic network theory of moral concepts can be derived that are useful for educational onsets. For example, due to the effects of automatic spreading on newly acquired semantic information in a net of moral concepts, new moral concepts must be recognized faster in semantic priming experiments after learning has occurred and an increase on moral schemata accessibility can be achieved. The absence of such a moral priming effect might be related to an absence of the formation of new meaning based on the acquired moral information. On the other hand, if moral priming effects are obtained due to learning moral concepts, it is highly probable that a coordinated cognitive apparatus could be also activated. Attention processes are of special interest to the present study since cognitive bias to consciously processed new moral information might also be assured.

To address this topic, the following studies were implemented in an effort to determine whether moral information is integrated in long term memory.

Method

Two word recognition studies on moral development are presented. The first one tests if a moral development program induces the acquisition of moral schemata. A priming experiment with a lexical decision task has been implemented to compare latencies of "moral related words" with latencies of "non related words" before and after a moral development course. Faster recognition was expected for "moral related words" after the course.

"Moral related words" were obtained from a semantic net technique (as it is described in the stimuli and materials section) that is based on participant's knowledge representation of moral concepts but not from an idiosyncratic or formal representation of moral knowledge.

The second study has been designed to test if attention performance is affected by acquired moral information.

Specifically, an attention task experiment has been designed to test if "moral related words" and "non related words" differentially interfere in an attention task. It was expected that "moral related words" could interfere controlled processes. Slower latencies were expected for the attentive task whenever "moral related word pairs" appeared.

The moral development course included in this study is based on Lind's educational intervention program derived from Kohlberg's moral dilemma discussion to promote moral development. A moral dilemma is a short story which presents a conflict. Over a discussion, a cognitive conflict is created when different points of view are presented. In this situation, it is assumed that a person reorganizes his system of thought. Students took a class of 50 minutes twice a week during twelve weeks.

First Study: Assessing Moral Schemata Priming

A pre-post test design was considered to examine if latencies for moral related words against a control were significantly different from the beginning and the end of a moral development program.

First Study Participants

Forty students of middle class in high school considered in the study were composed of the same number of female and male students; whose age ranged from 15 to 18 years old. These students were equally devided into two groups: experimental and control group.

First Study Instrument

Moral related words were obtained from a semantic network technique as follows:

Participants were given a booklet with a complete set of instructions and 20 moral concepts to define (target concepts). Each target concept was typed on a separate page and randomly presented to each subject. The only restriction for randomization was that across all 40 subjects, each concept should appear as the first one in the sequence of presentation for at least in one subject (for example, the concept "friendship" must appear at least as the first one to define). Subjects were asked to define the 20 target concepts one by one, using other single word concepts as definers (see Figure 1) which could be any noun or adjective, but nota complete phrase, pronouns, articles, prepositions or conjunctions.

JUSTICE	
RIGHTS	9
EQUALITY	10
TRUTH	6
POLICE	8
RESPONSABILITY	8
TRUST	9

FIG. 1. AN EXAMPLE OF THE DEFINITION TASK. THE TARGET CONCEPT "JUSTICE" IS DEFINED BY OTHER CONCEPTS (ANY NOUN, ADJECTIVE. NO COMPLETE PHRASES, PRONOUNS, ARTICLES, PREPOSITIONS OR CONJUNCYIONS ARE ALLOWED). AFTER THE DEFINITION TASK EACH DEFINER HAD TO BE RANKED IN A SCALE BETWEEN 1 AND 10.

After the definer for one concept had been completed and before the next concept will be defined, each definer for the current concept was rated on a scale from 1 to 10 according to its relevance to the target concept. Subjects were told that number 10 should correspond to the best definer(s), 9 to the next best, and so on. In the rating phase of the experiment, the subjects were allowed to use the same rating number for different definers and to skip any number if they wanted to do so. Participants were required to provide definers and ratings for each of the 20 concepts.

The maximum time allowed for the production of definers for each concept was 60 seconds; while 30 seconds were allowed for the rating of the definers for each concept. Subjects were given one solved example and one practice trial with totally unrelated target concepts at the beginning of the experimental session to make sure that they understood the task. For each of the 20 target concepts, the following values were computed.

- **M value:** The sum of the ranks is assigned by all the subjects to each definer concept. This is a relevant measure to each concept as a definition of the target concept.
- **SAM (Semantic Analysis of M value) group:** The basic group of 10 definers with the highest M values for the target concept. This is the set of 10 definers that construct most of the meaning of the target concept in a network.

Appendix A lists 10 out of 20 SAM groups with their respective semantic values.

As it can be seen from Appendix A that for several target concepts, students used some common definitions which are useful for setting up the connections among SAM groups of the different target concepts, and whose number will always depend on the domain of knowledge.

"Morally related words" were obtained from the generated SAM groups (Here, morally related words like "friendship" and "loyalty" are assumed to be morally related since they are the result of a conceptual definition of moral target concepts). These concepts were then compared against "non related concepts" and "associatively related words" in a word recognition experiment. Table 1 shows the schemata related words used in the semantic priming experiment. "Related and non related words" were randomly presented.

TABLE 1 MORAL WORD PAIRS FOR THE SEMANTIC PRIMING EXPERIMENT.

SCHEMA RELATED WORDS	
FRIENDSHIP-TRUST	DISCIPLINE-REWARD
FRIENDSHIP-FUN	HONESTY-DECEPTION
FRIENDSHIP-HELP	HONESTY-VALUES
FRIENDSHIP-UNDERSTAND	EQUALITY-WOMEN
FRIENDSHIP-SINCERITY	EQUALITY-MEN
LOYALTY-PARENTS	EQUALITY-PEOPLE
LOYALTY-PARTNER	EQUALITY-DISCRIMINATE
LOYALTY-SECURITY	LOVE-FIANCE
LOYALTY-GIVE	LOVE-FAMILY
JUSTICE-GOD	LOVE-NICE
LUSTICE-LAW	LOVE-GIVE
JUSTICE-RIGHTS	LOVE-LIVE
JUSTICE-GOOD	RESPONSABILITY-WORK
JUSTICE-POLICE	RESPONSIBILITY-DUTIE
JUSTICE-BALANCE	RESPONSABILITY- ORDER
DISCIPLINE-SCHOOL	RESPONSIBILITY-CARE
DISCIPLINE-BEHAVIOR	RESPONSIBILITY- TIMING
DISCIPLINE-OBEDIENCE	RESPECT-EDUCATED
DISCIPLINE-WORK	RESPECT-ELDERLY
DISCIPLINE-SUCCESS	

However, experimental stimuli presented in Spanish have been taken into account. Spanish word frequency and word size were controlled. Schema word primes are repeated for several times to ensure activation of the schema. However, repetition priming was avoided by excluding target words from repetition. The same

proportions for repeated primes were assured for "related and no related words".

First Study Procedure

Participants given an appointment to take the study at our Cognitive Science Lab, seated in front of a computer and instructions which were provided for their experimental task. Then a practice session was allowed before the study. Each practice trial consisted of three parts. A concentration point was presented at the center of the computer screen by 2000 ms. Then a second stimulus appeared which was a word they had to read silently (the prime), which was presented for 250 ms. Finally, a third stimulus was presented. Here, the subject's task was to decide whether the word was spelled correctly or not. The reaction time (RT) for each subject's decision was automatically registered by the computer. The Stimulus Onset Asynchrony (SOA), (the time that occurs between the onset of the prime and the target stimulus) was 300 ms, and the Inter Stimulus Interval (ISI) was 50 ms (a white screen between prime and target). The first word stimulus (Prime) (for example, POLICE) could be morally related or not to the second stimulus (Target) (for example, PARENTS). There were 20 practice trials and the word pairs were randomly presented.

The experimental events had the same experimental structure compared to the practice trials. Each participant taking 120 experimental trials spent about 15 minutes in going through all the trials.

First Study Results

Before the course a 2x2 mixed design ANOVA test was conducted over correct lexical decision reaction times. None of the participants had more than 5% error during the experimental trials. As expected, no main effect was obtained from both groups for the type of relation before the course $F(1, 38)= 0.16876$, $p > .05$.

After the moral development course, the experimental group showed a very different performance for the "moral related words". Here, a 2 (time) \times 2 (Type of group) \times 2 (Type of relation analysis) ANOVA mixed design analysis was carried out, taking into account only the subject's correct answers. A significant main effect for the type of relationship over the experimental group was obtained $F(1, 38)= 8.7480$, $p < 0.01$. Effect size $\eta^2_p = 0.18$. Figure 2 shows an interaction graph for the three factors included on the ANOVA analysis. As it can be seen from Figure 2 that

only the experimental group produced significantly faster responses after the moral development course, which is related to the statistically significant interaction $F(1, 38)= 11.469$, $p < 0.01$. Effect size $\eta^2_p = 0.23$, since an analytical comparison between related and non related words for the experimental group after the course tested as the only significant comparison $F(1, 38)= 329$, $p < 0.001$, and the only significant accounted variance for the effect of the design ("moral related words" after the course), $R^2 = 0.29$, $F(1, 38)= 17.70$, $p < 0.0001$

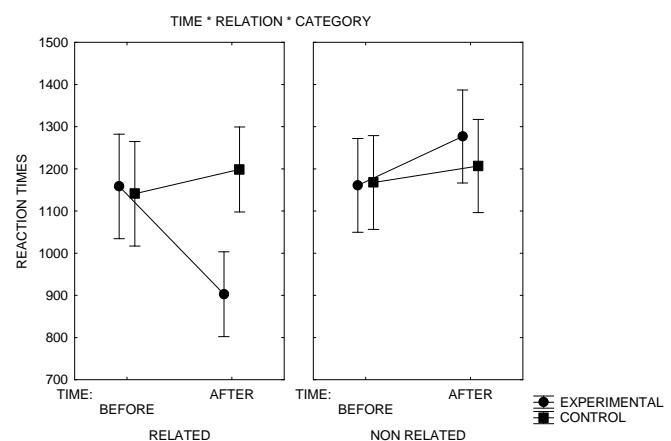


FIG. 2. ONLY THE EXPERIMENTAL GROUP SHOWED PRIMING EFFECTS FOR MORAL RELATED WORD PAIRS AFTER THE COURSE.

Second Study: Testing for Attention Mechanisms in Morally Related Words

As it was described initially, the purpose of this study was to test the influence of "moral related words" in attention processes only if moral schemata priming was obtained from the first study. This is because if semantic priming for "moral related words" was obtained from the first study, then the idea was to check if controlled processes related to attention processing were influenced by this schema priming effect.

Second Study Participants

In this second study the same students from the first study were considered.

Second Study Instrument

The stimuli for "moral related" and "non related word" pairs were the same as in the first experiment.

Second Study Procedure

Subjects seating in front of a computer were provided

with instructions for the experiment and then tested with practice trials and experimental events in order. Each experimental trial consisted of three stages as follows. Firstly, there was a concentration point at the center of the computer screen (2000 ms) and then a word pair was simultaneously presented. These words might be "moral related word pairs" or not (TRUST-RESPECT or ZUGAR - UNIVERSE) and appeared for 800 ms. Then one of the words was substituted by a dot. Here, the participant task was to decide if the dot was presented on the left or the right side. The purpose of this task is to investigate if "moral related words" affect the attention task.

Second Study Results

A 2x2 mixed design ANOVA test was conducted taking into account only correct lexical decision reaction times. Again, none of the participants made more than 5% error during the experimental trials. A significant main effect for the type of relation factor is obtained pooling both groups $F(1, 38)= 22.438$, $p < 0.0001$. Effect size $\eta^2_p = 0.25$. As it can be seen over the interaction graph of Figure 3 that this effect is mainly due to the experimental group latencies for "moral related words". These results provide some empirical evidence to suggest that the acquisition of new moral concepts triggers selective attention mechanisms to consume moral information.

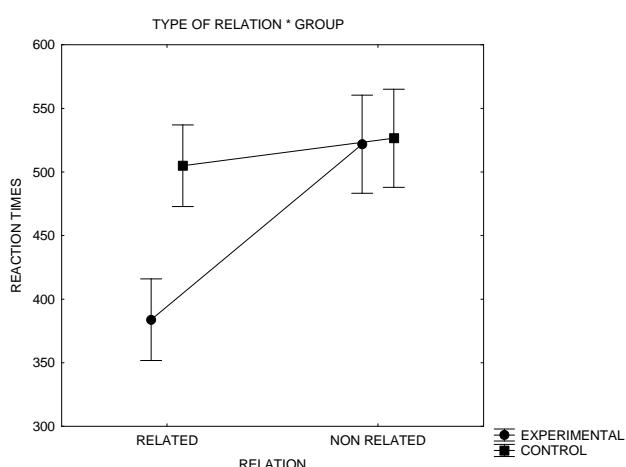


FIG. 3. "MORAL RELATED WORDS" FACILITATED THE ATTENTION TASK ONLY TO THOSE STUDENTS WHO TOOK THE MORAL DEVELOPMENT COURSE.

Discussion

Moral development assumes that a person changes through life whenever s/he is within a favorable

environment. This is possible because cognitive accommodation is elicited whenever a change is observed in the person's behavior. In this study, student's participation in a moral development course shows that a change on moral schemata has been produced on processing moral information, due to the significant difference the pre-post latencies on the semantic priming experiment for the experimental group compared to the control group, suggesting evidence for moral schemata priming (for additional evidence on schemata priming to other knowledge domains). These changes come from moral schema development and the study suggests that these schema modification affect automatic and controlled processes. Thus, moral reasoning might have two available cognitive resources. The first could come from conscious and controlled responses that are addressed by schemata representation. The second could be attributed to automatic responses coming from schemata activation without the implication of a moral judgment. Generally speaking, even when experimental data suggests that cognitive schema acquisition happens and that this assimilation affects control and automatic processing of moral information, it does not necessarily mean that a change in moral stages is taking place. This is clearly confirmed by the fact that a test on moral judgment (MJT; Lind in press) has been taken by the students and showed no change on moral competence due to the course.

Then human processing information techniques were conducted to measure different cognitive indicators of moral reasoning compared to traditional cognitive moral models. These indicators are related to new meaning formation on moral content and coordinated cognitive processing to consume moral information. These might shed light on what happens between stages of moral development.

Cognitive evaluation of meaningful learning is a current trend in educational fields. Complementary information useful for traditional ways to evaluate learning in educational settings is obtained by identifying what is learned in long term memory and the way in which it is used to achieve learning habits [10]. Thus, whether a student has a cognitively tuned system to consume specific moral content can be assessed by the methodology illustrated in this study. Of course, more study is needed to establish new research lines that lead to moral processing models in moral reasoning. For example, schemata computer simulations can be implemented through subject's

conceptual definitions to analyze moral schema organization. Specific predictions to moral priming experiments might arise from moral concept organization before and after learning.

REFERENCES

Anderson, N.H. (1991). Moral-social development. In: N.H. Anderson, ed., *Information Integration Theory*, Volume III: Developmental, pp. 137-187. Hillsdale, NJ: L. Erlbaum.

Anderson, N.H. (2007). Moral algebra. In: N.H. Anderson, ed., *Unified social cognition: Scientific psychology series*, pp. 199-222. New York: Psychology Press.

Kohlberg, L. Power, C., Higgins, A. (1998). *La Educación Moral según Lawrence Kohlberg*. Barcelona, España: Gedisa editorial.

Lind, G. (2000). The importance of role-taking opportunities for self-sustaining moral development. *Journal of Research in Education* 10(1), 9-15.

Lind, G. (2007). *La moral puede enseñarse. Manual teórico-práctico de la formación moral y democrática*. México: Trillas.

Lind, G. (in press). The meaning and measurement of moral judgment competence revisited -- A dual-aspect model. In: D. Fasko and W. Willis, Eds., *Contemporary Philosophical and Psychological Perspectives on Moral Development and Education*. Cresskill, NJ: Hampton Press, pp. 185 - 220.

Lopez, R.E.O. and Theios, J. (1992). Semantic Analyzer of Schemata Organization (SASO). *Behavior Research Methods, Instruments and Computers*. 24 (2), 277-285.

Lopez R.E.O., Padilla, M.V.M. and Rodriguez, N.M.C. Connectionist schemata based behavior based on subject conceptual definitions: The role of inhibitory mechanisms, (2006) *4th International Conference on Memory*. University of New South Wales, Sydney, Australia.

Marzano J., Brandt, R. S., Hughes, C. S., Jones, B. F., Preseissen, B. Z., Rankin, S.C. and Suhor, C. (1991) Dimensions of thinking: A framework for curriculum and instruction. In: Arthur, L. Costa (Ed.). *Developing minds: A resource book for teaching and thinking*. Alexandria, Virginia: ASCD.

Marzano, R. J., Pickering, D. J., and Pollock, J. E. (2001). *Classroom instruction that works: Research-based strategies for increasing student achievement*. Alexandria, VA: ASCD.

Mcnamara, T.P. (2005). *Semantic priming: Perspectives from memory and word recognition*. New York: Psychology Press.

Murphy, G.L. (2002). *The big book of concepts*. Cambridge, Massachussets: MIT Press.

Narvaez, D., Lapsley, D. K., Hagele, S. and Lasky, B. (2006). Moral chronicity and social information processing: Tests of a social cognitive approach to the moral personality. *Journal of Research in Personality* Vol. 40, 966-985.

Padilla, M.V.M., Lopez, R.E.O. and Rodriguez, N.M.C. (2006). Evidence for schemata priming. *4th International Conference on Memory*. University of New South Wales, Sydney, Australia.

Padilla, M.V.M., Peña, M.V.G., Lopez, R.E.O. and Rodríguez, N.M.C., Using natural semantic networks to evaluate students performance on school courses (2006), *4th International Conference on Memory*. University of New South Wales, Sydney, Australia.

Piaget, J. (1977). *The Moral Judgment of the Child*. London, Great Britain: Cox and Wyman.

Rogers, T.T., and MccCelland, J.J. (2004) *Semantic cognition: A parallel distributed approach*. Cambridge, Massachusetts: MIT Press.

Sprinthall, N. and Collins, A. (1995) *Adolescent Psychology*. A Developmental View. New York, USA: McGraw Hill.



Dr. Claudia J. Gonzales obtained her PhD in psychology at the Universidad Autonoma de Nuevo Leon in Monterrey, Mexico. Currently, she is a professor at the Universidad of Monterrey, and she is interested in connectionist modeling of moral schemata and the applications and implications of this approach to educational settings.



Dr. Ernesto O. Lopez obtained his PhD on Human Cognition from the University of Wisconsin- Madison. He is currently a professor at the Universidad Autonoma de Nuevo Leon, in Mexico. His research interests are related to memory and emotion as well as new ways to evaluate students learning using connectionist machines



Dr. Guadalupe E. Morales obtained her PhD in psychology at the Universidad Autonoma de Nuevo Leon where she is currently a Professor. She is interested in atypical cognitive and emotional behavior underlying Down syndrome people. Specifically, her research addresses cognitive processes of blaming behavior, moral behavior in special education as well as studding Down syndrome deficits to recognize negative facial recognition.

APPENDIX A

(SAM groups)

<u>FRIENDSHIP</u>	<u>LOYALTY</u>
1. TRUST 142 2. LOVE 126 3. FRIEND 118 4. RESPECT 97 5. AFFECTION 74 6. FUN 63 7. HELP 58 8. UNDERSTANDING 57 9. SINCERITY 48 10. LOYALTY 45	1. FRIENDSHIP 146 2. LOVE 113 3. TRUST 83 4. RESPECT 82 5. LOYALTY 79 6. FRIEND 73 7. HONESTY 57 8. PARENTS 50 9. PARTNER 36 10. SECURITY 29
<u>JUSTICE</u>	<u>EQUALITY</u>
1. GOD 100 2. LAW 71 3. HONESTY 66 4. EQUALITY 60 5. TRUTH 60 6. RIGHTS 44 7. RESPECT 40 8. GOOD 36 9. POLICE 32 10. EVALUATION 30	1. JUSTICE 147 2. RESPECT 119 3. WOMEN 51 4. MEN 46 5. RIGHTS 46 6. BALANCE 40 7. PEOPLE 37 8. LOVE 36 9. LOYALTY 33 10. DISCRIMINATE 31
<u>DISCIPLINE</u>	<u>HONESTY</u>
1. SCHOOL 97 2. RESPONSIBLE 81 3. PARENTS 54 4. BEHAVIOR 49 5. OBEY 39 6. GOOD 35 7. SPORTS 33 8. WORK 32 9. SUCCESS 29 10. REWARD 29	1. RESPECT 194 2. TRUST 70 3. SINCERITY 65 4. HONOR 48 5. DECEPTION 36 6. LOVE 35 7. FRIENDHISP 35 8. VALUES 34 9. GOOD 33 10. SECURITY 32
<u>TRUST</u>	<u>LOVE</u>
1. FFRIENDSHIP 180 2. LOVE 82 3. PARENTS 67 4. LOYALTY 53 5. TRUTH 45 6. RESPONSIBLE 45 7. SECURITY 42 8. HONESTY 41 9. RESPECT 36 10. SINCERITY 35	1. FRIENDS 175 2. PARENTS 105 3. TRUST 103 4. FAMILY 100 5. GOD 90 6. AFFECTION 89 7. FIANCE 85 8. NICE 77 9. GIVE 49 10. LIVE 48
<u>RESPONSIBLE</u>	<u>RESPECT</u>
1. SCHOOL 96 2. HOMEWORK 80 3. PARENTS 77 4. WORK 67 5. RESPECT 50 6. DUTIES 48 7. ORDER 42 8. DISCIPLINE 37 9. CARE 34 10. PUNCTUALITY 34	1. PARENTS 157 2. LOVE 112 3. FRIENDSHIP 108 4. AFFECTION 54 5. EDUCATED 54 6. ORDER 53 7. GOD 45 8. VALUES 45 9. ELDERLY 49 10. FRIENDS 36